THE FOSSIL COLLECTOR

BULLETIN No. 79 JANUARY 2007

Almost mistaken for a truck tyre, the Holotype of ***Tropaeum imperator*** (SAM P13821) – the largest known ammonite in Australia – was found in the Early Cretaceous (Aptian) Bulldog Shale at Cooper Pedy, South Australia, by Constable T. Jury in 1923. Uncoiled, this fully grown adult would be 3 metres long. Information provided by the Discovery Centre, S. A. Museum, Adelaide. Photograph, Frank Holmes.

Published by
THE FOSSIL COLLECTORS' ASSOCIATION OF AUSTRALASIA
ISSN 1037-2997

THE FOSSIL COLLECTORS' ASSOCIATION OF AUSTRALASIA

SECRETARY/TREASURER
Frank Holmes. 15 Kenbry Road, Heathmont. Victoria. 3135. (03) 9729 0447
Email: fholmes@bigpond.net.au

EDITOR
Paul Tierney. 11 Lyndhurst Terrace, Caboolture QLD. 4510. (07) 5497 4188
Email: palaeopaul@aapt.net.au

STATE REPRESENTATIVES

Australian Capital Territory
Mrs. M. Webb. Fairlight Station, R.M.B. 141, Weston. 2611. (02) 6236 5123

New South Wales
Eric Nowak. 29 Bungalow Road, Roselands. 2196. (02) 9758 1728

South Australia
John Barrie. 1 George Terrace, Coonalpyn. 5265. (08) 8571 1172

Queensland
Ian Sobbe. M/S 422, Clifton. 4361. (07) 4697 3372

Victoria
Frank Holmes. 15 Kenbry Road, Heathmont. 3135. (03) 9729 0447

CONTENTS

KNOW YOUR 'CENOZOIC'?

Frank Holmes

A 'Geologic Note' by Amos Salvador in the American Association of Petroleum Geologists (AAPG) Bulletin, brought to mind my early confusion with the division of the Cenozoic Era into Periods, Epochs, and to a lesser extent Stages, when compared with the division of the Paleozoic and Mesozoic.

While I had learnt that the Tertiary and the Quaternary together constituted the Cenozoic, for some reason I was never taught that the Tertiary was divided into two periods, the Paleogene and the Neogene, the boundary between the two being the Epoch boundary that separates the Oligocene and the Miocene.

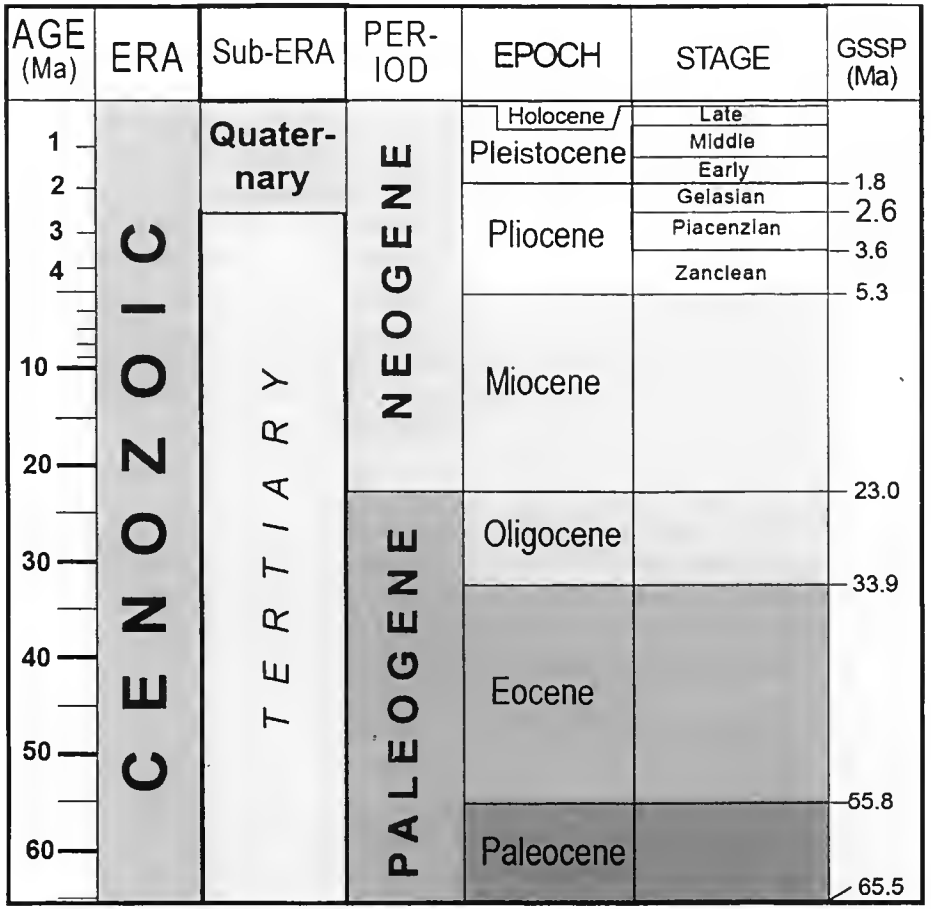
I'm sure most amateur fossil collectors have at some stage found it difficult to come to terms with the Cenozoic Era having Epochs with specific names, i.e. Paleocene, Eocene, Oligocene, Miocene, Pliocene, Pleistocene and Holocene, while the Paleozoic and Mesozoic Eras generally have their periods merely divided into Lower, Middle (not always) and Upper Epochs. The exceptions, for whatever reason, being the Cambrian, which now has the Upper Epoch named Furongian; the Silurian, a brief period of geologic time divided into Llandovery, Wenlock, Ludlow and Pridoli; the Carboniferous, which in North America has the Lower and Upper Epochs named Mississippian and Pennsylvanian respectively; and the Permian, which has recently been divided into Cisuralian, Guadalupian and Lopingian.

Now that you are completely confused, the reason for this note is to bring to your attention that the International Commission on Stratigraphy (ICS) published geologic time scales in 1989 and 2000 which did away with the term 'Tertiary' and in 2004, the term 'Quaternary'. Both these terms originally being considered Sub-Eras.

After a review of a wide range of geologic literature published over the last 25 years, Salvador (2006) notes that the use of the terms 'Tertiary' and 'Quaternary' by geologists the world over has not declined at all. He goes on to say "Past attempts to eliminate the Tertiary and Quaternary have been ignored. Recent attempts will not succeed either."

Just to check that I was not making any gross errors in writing this note,

I went online on New Years Eve to check the current 'International Stratigraphic Chart' to find that the chart I had downloaded (sometime in 2005) has been revised. Yes, the 'Quaternary' was back again as a Sub-Era (not a Period)! What's more, it has now been expanded from including just the Pleistocene and Holocene (1.8 my) to include the Gelasian, the upper Stage of the Pliocene. Consequently, the Quaternary now covers the last 2.6 my (see attached Cenozoic Time Scale). While the Tertiary is still shown; the 'International Stratigraphic Chart' notes it as an "Informal chronostratigraphic unit'. If you look at the attached Time Scale you will also see that the Neogene Period now extends to the present!



Cenozoic Time Scale showing Quaternary Sub-Era (not to scale)

While not all of the following names are specifically related to the Cenozoic, the inconsistency outside the USA in the spelling of words that originally incorporated the Latin 'æ', still creates confusion amongst amateurs, as well as editors of most non-scientific publications. The words that cause this confusion, though all are correct in themselves, are: 1, Paleozoic; 2, Paleogene; and 3, Paleocene; each being spelt either Pale... or Palae... This of course also applies to the word 'paleontology' and all its derivatives. All right you say, the Americans are responsible for dropping the second 'a', while most of the world still use 'ae'. Fine, no problem – except the rest of us seem to pick and choose which spelling to use.

As an example of this confusion, I checked a few publications from my library (not always the most recent editions I must admit).
Harland, et al., 1982, (a now superseded geologic time scale) followed the American spelling, although published by Cambridge University Press in the UK. *An Australian Phanerozoic Time Scale*, 1996, (published by Oxford University Press in Melbourne) follows the European spelling with 'ae' in 'Palaeogene' and 'Palaeozoic' but not in 'Paleocene'. This latter combination is also followed by Museum Victoria in their online Time Scale. *The Oxford Dictionary of Earth Sciences*, 1999, uses 'ae' in its primary entries but does show the alternative American spelling 'Paleocene' and lists the prefix 'paleo' as an alternative spelling to 'palaeo'. As you would expect, the International Commission on Stratigraphy omits the second 'a' in all its publications. New Zealand, rather surprisingly, follows the American spelling but Canada doesn't. To add to this confusion, your PC's 'spellchecker' (Microsoft Word) incorporates the second 'a' in all three words if the language box is set for English (Australian), however, it does accept both 'ae' and 'e' in 'Paleozoic'!

Finally, the word 'Cenozoic' itself. This would seem to be the most common spelling, although the European 'Cainozoic' is still fairly widely used – even by my PC 'spellchecker'. But why does my stalwart Oxford Dictionary of Earth Sciences, 1999, use 'Cenozoic' as its primary entry when for all the 'P' words ('Paleocene' excepted) it insists on 'ae'?

Incidentally, Kainozoic and Caenozoic are also listed as alternative spelling for Cenozoic, and Anthropogene and Pleistogene for Quaternary. I doubt if any of these are used today, although I did find 'Caenozoic' in *The Succession of Life through Geological Time* (1967).

For consistency, and I believe simplicity, I have generally used the American spelling as the basis for this article – as an Englishman, I expect to be shot at dawn.

References:

Salvador, A., 2006. The Tertiary and the Quaternary are here to stay. *American Association of Petroleum Geologists* 90(1), p. 21; DOI: 10.1306/08090505093

International Commission on Stratigraphy web site viewed on 24/12/2006: http://stratigraphy.org/

Cenozoic Time Scale showing Quaternary Sub-Era. From ICS "Definition and Rank of Quaternary – 28 Sept 2005, p. 3."

FROM DESERT SANDS TO ARTIC SNOWS

Tom Rich, Curator of Vertebrate Palaeontology, Museum Victoria.

Thirty one years ago, Pat and Tom Rich spent a rather warm week in Saudi Arabia at the beginning of summer. While there, they recovered a small collection of Middle Triassic marine reptiles. They were only able to work a few hours a day because of the high temperature, so the result was about as much as could be expected in an area that had not previously been explored for fossil vertebrates. For years it seemed to be a dream that would never be fulfilled – to be able to return someday to see if articulate skeletal material could be found in the rocks of the Julh Formation we visited in 1976.

However, contact with the Saudi Geological Survey to establish a general vertebrate palaeontological programme in the Kingdom was eventually made a few years ago. The first project to stem from this association will be to see if further marine reptiles can be recovered from the Julh Formation. This formation extends as a cuesta for 700 km across the desert in eastern Saudi Arabia, so there is a lot of potential for discovering the much sought after fossils. At the time of writing, an exploratory trip is scheduled to run from mid January to mid February, 2007.

Because of the interest that Pat and Tom Rich share in the polar dinosaurs of Victoria, in 1989 they visited a site on the banks of the Colville River in northern Alaska that has also yielded polar dinosaurs.

While there, Tom came up with a somewhat unusual idea of how to avoid the danger of collapsing banks, a problem that had become quite apparent during their stay. This was to tunnel into the banks. On the surface, the permafrost supporting the banks melts in the summer, hence the collapse. Underground, however, the permafrost remains frozen all year round, so if an adit was cut in the winter, as Alaskans typically do when digging an adit in the permafrost for gold, the danger would be reduced significantly. In addition, the fossil bone found deeper underground would not have frozen and thawed repeatedly and thus would be in better shape than that from the freeze-thaw zone.

A nice idea, but getting the money to do it has taken 14 years, It is only because of a film documentary maker by the name of Ruth Berry of Big Island Pictures, Brisbane, who wants to film it, that the project is going to go ahead next March. This is palaeontological engineering rather than palaeontological fieldwork in the conventional sense. The object is to find out if this approach is worth employing in the extensive permafrost exposures on the Colville River. For there, the dinosaur bearing deposits extend for 200 km along the left bank of the river and cover the last 40 million years of the Mesozoic. If it proves useful, it could revolutionise the study of polar dinosaurs. This is because the banks of the Colville River are the most extensive outcrops of rock that are known to contain polar dinosaurs anywhere on Earth and the river is already known to yield fossils in many places.

THE ORIGIN OF THE RIDICULOUS

Carl Zimmer

The FCAA is indebted to Carl Zimmer for permission to reprint the following article published on line in "The Loom – A blog about life, past and present". Carl Zimmer is a science writer, his articles appearing in the New York Times and many magazines. He is also the author of five books on science. We are also indebted to Erich Fitzgerald (Monash University & Museum Victoria) for use of the photograph and evolutionary tree.

Whales are beautifully ridiculous. They are majestic divers, in some cases plunging nearly two miles underwater, and yet sooner or later they must rise back to the surface to breathe air. They breathe through a rather ridiculous-looking hole in the top of their head and unlike fish, which often reproduce by spraying millions of eggs and swimming away,

whales give birth to one calf at a time, which they proceed to nurse for months. Some whales are like underwater bats, shrieking through their blowholes and listening to the echoes. Perhaps most ridiculous of all are whales that turn themselves into giant filters, thanks to a ridiculous tissue called baleen.

Baleen is a giant frond-like growth that sprouts from the jaws of 11 species of whales. Baleen whales open up their toothless mouths, sucking in clouds of krill and other animals. They then ram the water out with their massive tongues, trapping food in their overlapping plates of baleen. Licking off the food, they open their mouths for another gulp.

Whales are ridiculous thanks to their history. They evolved from mammals on land; their swimming, reproduction, breathing, and other adaptations to life in the water being the result of tinkering with a terrestrial animal's body. Fossil discoveries have documented how adaptations to life in the water being the result of tinkering with a terrestrial animal's body. Fossil discoveries have documented how

Figure 1. Skull of *Janjucetus hunderi* from Jan Juc, Victoria.

coyote-like mammals moved into the water about 45 million years ago and became more and more adapted to marine life. However, the evolution of whales was not a single leap but a long series of transitions. Even after whales had abandoned life on land, they were still not yet like whales are today. None of them, for example, had baleen.

Among living whales, baleen is an all-or-nothing affair. If you're a whale you either have baleen or you don't. All other whales are profoundly different, with teeth instead of baleen, and while toothed whales can all echolocate, baleen whales cannot. Studies on whale DNA only reinforce the sharp divide between baleen whales and other whales. All baleen whales share genetic markers not found in toothed whales. In other words, the evolutionary tree of living whales is split into two branches. Palaeontologists have found many extinct members of those two branches from the past 30 million years, bearing the hallmarks of either baleen whales or toothed whales.

In a sense, then, the origin of baleen whales is as remarkable as the origin of all whales. Yet that fact does not represent a real challenge to evolution. After all, there was a time when scientists had not yet found walking whales, and now they've found plenty. Other scientists have meanwhile been searching for fossils of the earliest baleen whales and, as I'll describe, they've now found a particularly interesting one: a baleen whale without baleen!

The whale in question is called *Janjucetus hunderi*, named after the Australian town of Jan Juc where it was found and a Mr. S Hunder who found the fossil. Among its 25 million year old remains are a nearly complete skull, some vertebrae, ribs, and a bone from its flipper. As you can see from the skull, which is shown here, this was an animal with big eyes and plenty of sharp teeth. To understand where it fits in the history of life, Erich Fitzgerald, a graduate student at Monash University in Australia made a careful study of the bones. He then compared over 200 fine anatomical details in *Janjucetus* to 23 other whale species. Some of these whales are living and some extinct, including a few that have yet to be fully described by scientists. Fitzgerald also compared these whales to pigs and hippos, which are among the closest terrestrial relatives to whales. The results of his study appear in the Proceedings of the Royal Society of London. Here I've reproduced the evolutionary tree that sums up his work.

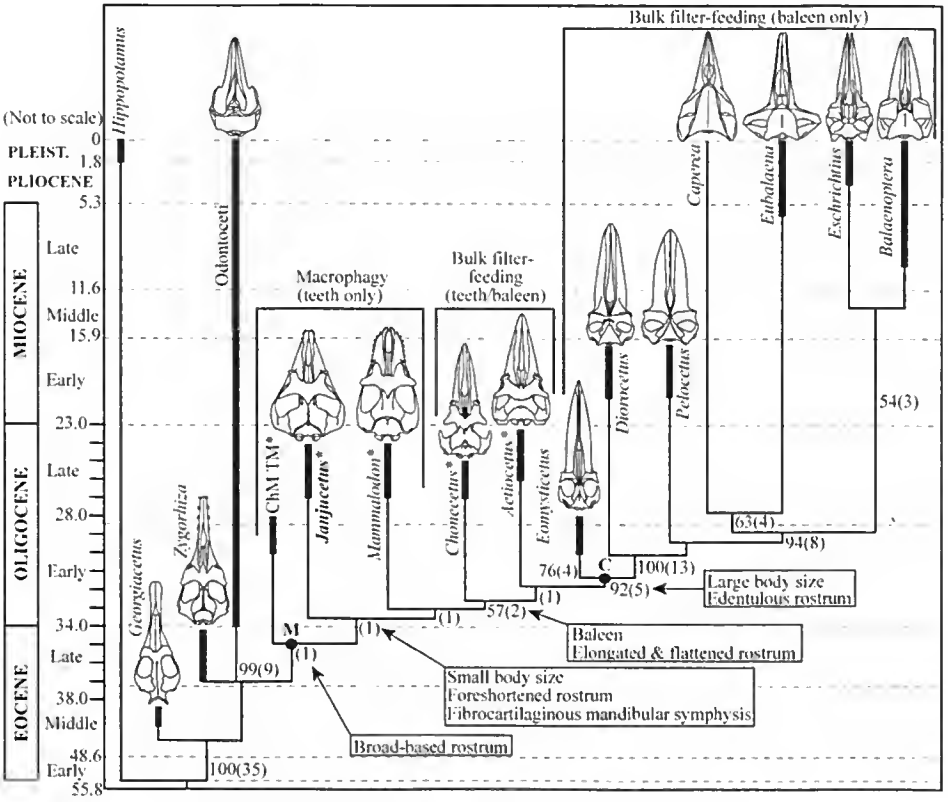


Figure 2. The lineage that gave rise to modern toothed and baleen whales.

The new results support previous studies, showing that living whales only represent the crown of branches on a very deep tree. The common ancestor of toothed and baleen whales lived about 35 million years ago, about 10 million years after early whales began moving into the water. As I described in my book, *At the Waters Edge*, whales lost their hind legs almost completely during those ten million years, except for a few vestigial bones in their body wall. Their nostrils moved partway up their snout and their ears adapted for hearing underwater. The lineage that gave rise to the toothed and baleen whales is the only one that survives today, while all the other whales became extinct.

Janjucetus is a whale with teeth and yet Fitzgerald found that it

Belongs to the baleen lineage, not the living toothed whales, nor to an earlier branch of the whale's evolutionary tree. Its teeth may bear no resemblance at all to the frond-filled mouths of living baleen whales, but *Janjucetus* shares with them some key traits not found in other whales, such as very wide lower jaw bones that were joined at the front not by a bony chin but by a mesh of cartilage.

Fitzgerald points out that Janjucetus' sharp teeth, powerful biting muscles, and big eye sockets make it resemble a leopard seal. He argues that it got food in the same way, hunting after individual fish and tearing their bodies apart. On its hunts, *Janjucetus* may have also relied on a sharp sense of hearing. It had a large hollow space in its lower jaws, which may have been stored with fat that could have conducted sound to its ears. However, it shows no trace of the equipment toothed whales use for echolocation. In other words baleen whales evolved baleen long after splitting off from other whales. Their baleen-free ancestors apparently thrived as leopard-seal-like hunters for millions of years. Over time, their descendants evolved some of the traits that are found in all baleen whales today. Their jaws grew flatter and more pointed. They still had teeth which they may have been able to use to filter food. Their teeth had changed shape, so that they were no longer good for shearing. Instead, they locked together, similar to the teeth of crab-eating seals which are used for filtering prey. As these whales shifted away from a leopard-seal lifestyle, their eyes got smaller as well.

Some of these transitional whale fossils not only have teeth but also have marks suggesting they also held baleen. Baleen plates are not giant teeth, they are made of keratin, the stuff in our hair and fingernails, rather than enamel. As Fitzgerald's evolutionary tree shows, the mixed-mouth whales give rise to new species that kept the baleen and lost the teeth. They had become fully adapted to a new style of filter-feeding with dramatic results: baleen whales proceeding to evolve to much bigger sizes. With the emergence of the blue whale, they became the biggest animals to ever exist on Earth.

Yet even the first 'true' baleen whales were not like today's baleen whales. Some fine-tuning still remained, such as pushing the blow hole all the way to the top of the head. But as Darwin himself noted, today's true baleen whales still preserve signs of their distant toothy past. Their embryos develop tooth buds which are absorbed into the jaw as plates of baleen grow over them.

This study of *Janjucetus* is hardly the last word on baleen whale evolution. Palaeontologists have found a number of other early baleen whale fossils that have yet to be carefully studied – a process that can take years. For example, the branch marked ChMTM represents some whale fossils at the Charleston Museum of Natural History that have yet to be named. Fitzgerald's analysis suggests that these fossils are even more primitive than *Janjucetus*. You can expect more work on baleen whale DNA and even on the evolution of their development (which embryonic signals changed to produce baleen and kill off teeth). Palaeontologists will be offering insights into the environment in which these whales emerged – a cooling ocean in which krill and other plankton began to reproduce in bigger concentrations. Whale evolution is a very big picture and one that's still coming into focus.

But Janjucetus already points to some important rules about major evolutionary transformations. As species adapt to new ecological niches, they become mosaics of primitive and advanced traits. It's much the same story for baleen whales as for land vertebrates, as demonstrated by the fish with legs, *Tikaalik*, that made news earlier this year. Lurking in the Earth are strange beasts that straddle the divides of life as we know it today.

Source:

Fitzgerald, E. M. G., 2006. A bizarre new toothed mysticete (Cetacea) from Australia and the early evolution of baleen whales. *Proceedings of the Royal Society B: Biological Sciences*, Volume 273, Number 1604: 2955-2963. [DOI:10.1098/rspb.2006.3664]

GOGONASUS: AN ANCIENT FISH ADVANCED FOR ITS AGE!

In 2005, Dr Tim Senden from the Department of Applied Mathematics, Australian National University, Canberra, found a spectacularly preserved 380 million year old specimen of the Late Devonian fish *Gogonasus andrewsae*, in the remote Kimberley region of Western Australia (Fig. 1).

According to palaeontologist Dr John Long, Head of Science at Museum Victoria, the specimen is the most perfect complete three-dimensional fossil fish of its kind ever discovered in the world, having an almost complete intact skull (Fig.2), body and fin bones.

Its importance in advancing the knowledge of the transition from fishes to tetrapods (vertebrate animals with four limbs), stems from the fact that this new specimen of *Gogonasus* has been found to have a number of features common to land animals.

Following a 3D X-ray microscope scan at the ANU, *Gogonasus* is now known to have an opening in the skull leading to the gill chamber, indicating it breathed air. This opening is similar to that found in the first land animals and a feature that eventually became the eustachian tube (a tube which connects the pharynx to the middle ear) in higher vertebrates.

Analysis by the research team from Museum Victoria, Australian National University, and Monash University, has also revealed the fish's pectoral fins have a pattern of bones (a humerus, an ulna and a radius) similar to the forelimb or arm of land animals. Nevertheless, it was definitely a fish with gills and fins, but one that shows the beginnings of the tetrapods' advanced body plan that would eventually carry on to all living land animals. In addition, it has a cheek bone structure similar to early amphibians and a single pair of nostrils like humans.

Previously *Gogonasus*, a lobe-finned fish about 30 cm long covered with diamond shaped scales (Fig.3), was known only from crushed and fragmentary fossil remains described by Dr Long in 1985.

Dr Gavin Young, from the ANU Department of Earth and Marine Sciences, notes in a recent media release that earlier reports on

Fig. 1

Figure 1. Drs John Long (left) and Tim Senden on finding the new specimen of *Gogonasus*, July, 2005.

Figure 2. Lateral view of the restored skull of *Gogonasus andrewsae* Long, 1986, found by Tim Senden on the 2005 Gogo expedition.

Figure 3. Artist's impression of *Gogonasus* (Image: Brian Choo/ Museum Victoria).

Figure 4. Diagram showing the transition from fish to land vertebrates over a period of approximately 20 million years during the Late Devonian.

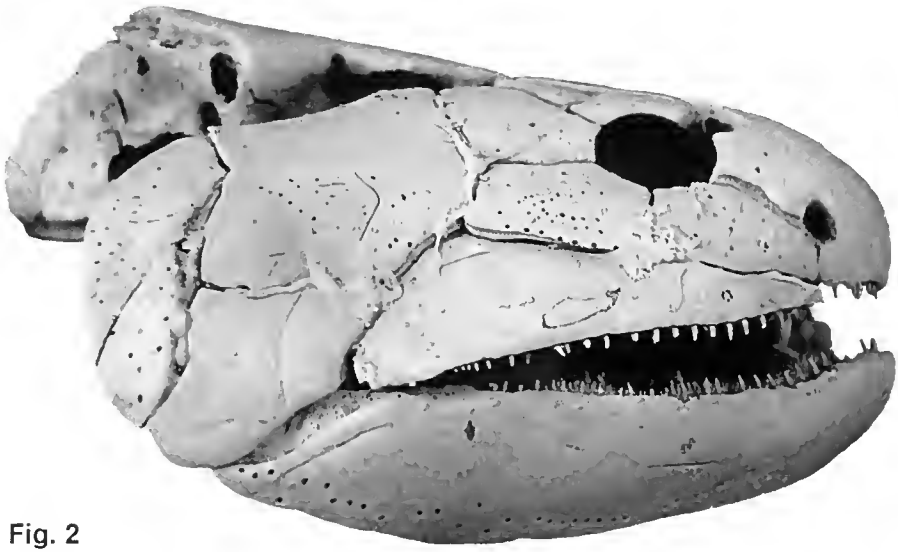


Fig. 2

Fig.3

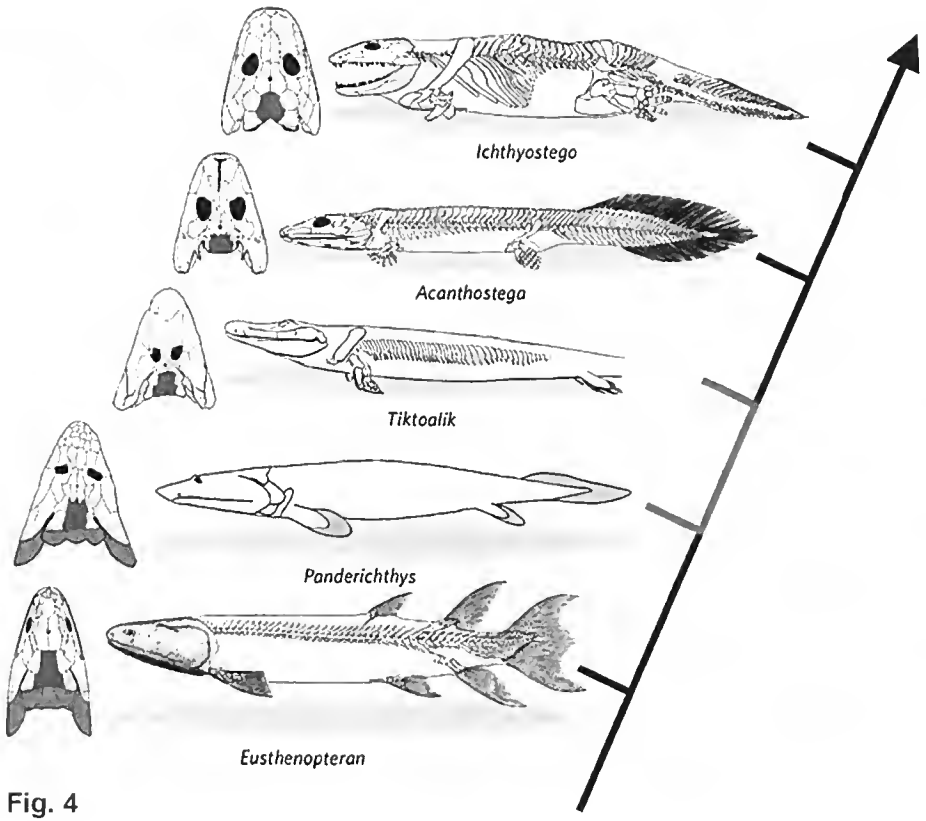

Ichthyostega
Acanthostega
Tiktoalik
Panderichthys
Eusthenopteran

Fig. 4

transitional forms have tended to focus on the evidence of animals moving onto the land in the Northern Hemisphere, while Australian fossils have gone under-reported. Tetrapods are known to have lived in Australia around 370 million years ago because of trackways preserved in rocks of this age in Victoria, and a single tetrapod jaw discovered years ago near Forbes, New South Wales. In Australia large areas of rock strata of the right age are still unexplored, although palaeontologists are gradually searching these to find additional fossil evidence of the first land animals to have inhabited the southern hemisphere continents.

Early in 2006, scientists reported the discovery on Ellesmere Island in Nunavut, Canada, of a 375 million year old species of lobe-fined fish named *Tiktaalik roseae*, a fish that reputedly filled the evolutionary gap in the transition between water and land animals. However, while *Taktaalik* had a skull that was identical to an amphibian, *Gogonasus* is much more fish-like in appearance. In fact, Dr Long, considers *Gogonasus* is more closely related to land animals than a fish called *Eusthenopteron*, which until recently was considered the common ancestor of all land animals (Fig. 4).

Daeschler, E. B., Shubin, N. H. and Jenkins, F. A. Jnr, 2006. A Devoniam tetropod-like fish and the evolution of the tetrapod body plan. *Nature* 440: 757-763 (06 April 2006).

Long, J. A., 1985. A new osteoleopid fish from the Upper Devonian Gogo Formation of Western Australia. *Records of the Western Australian Museum* 12: 361-377.

Long, J. A., Young, G. C., Holland, T., Senden, T. J. and Fitzgerald, E. M. G., 2006. An exceptional Devonian Fish from Australia sheds light on tetrapod origins. *Nature* 444: 199-202 (09 Nov. 2006).

References:

Information compiled by Frank Holmes from several press and internet reports published at the end of October, 2006. Photographs provided by Dr John Long.

IN THE NEWS

FROZEN IN TIME: FOSSILS FROM THE ANTARCTIC

Antarctica is a vast continent with a complex geological history yielding a rich and diverse fossil record yet, due to an extreme and hostile climate today, this fauna and flora is still incompletely known. The British Antarctic Survey, based in Cambridge, houses one of the largest collections of Antarctic fossils anywhere in the world, ranging from Cambrian trilobites to Cenozoic molluscs, plus many spectacular plant fossils. High-resolution images have been made of the Type and Figured collection which, together with taxonomic, stratigraphic and locality data, are now easily accessible via the Internet:

http://www.antartica.ac.uk/Resources/GSD/fossils/

Up to 1,000 types, including over 150 holotypes, are held within the collection, which is particularly rich in Mesozoic taxa from the Antarctic Peninsula. Given the central locality of the Antarctic in the Gondwanan super continent, this collection is of high significance for taxonomic and biogeographical studies in the Southern Hemisphere.
Information from Lucy A. Wilson, A. J. Tate and J. A. Crame, 2006 (British Antarctic Survey, Cambridge, UK), via *The Palaeontological Association Newsletter* 63.

GIANT 'TERROR BIRD' WAS LIGHT ON ITS FEET

This article by Debora MacKenzie first appeared in NewScientist.com news service, 25 October, 2006, and is reprinted with permission.

The first near-complete skull of a giant "terror bird", belonging to the phorusrhacid family, has been discovered in Cormallo, Argentina, allowing scientists new insight into the agility of the flightless prehistoric monsters.

Giant flightless birds up to 3 metres tall were the top predators in South America between 60 million and 2 million years ago. While it was known that phorusrhacids could be big, until now there has not been a fossil complete enough to tell what the biggest looked like.

Scaling up the remains of smaller birds in the family suggested the big

birds were heavy, lumbering creatures. But scientists from the Natural History Museum of Los Angles County, USA, have just found the first nearly complete skull and other bones from the biggest yet, which lived 15 million years ago in the Middle Miocene of Patagonia.

The skull and leg bone were proportionately more slender than would be expected if the bird were simply a scaled-up version of its smaller cousins. This suggests there was a selective pressure to stay light, as the birds got bigger. That, say the scientists, means bigger may not necessarily have meant slower – bad news for the dog-sized mammals these early birds ate.

Reference:

Chiappe, L. M. and Bertelli, S., 2006. Brief Communiations: Palaeontology: Skull morphology of giant terror birds. *Nature* 443, p. 929; DOI:10.1038/443929a

EUROPEAN DINOSAUR WAS A GIANT

The remains of the biggest dinosaur known to have lived in Europe have been found in an abandoned wheat field near the village of Riodeva, in Teruel Province, eastern Spain, according to a report in the journal *Science*.

Researchers from the Fundación Conjunto Paleontológico de Teruel-Dinópolis found dozens of sauropod bones in the Upper Jurassic-Lower Cretaceous Villar del Arzobispo Formation at the Barrihonda-El Humero site in Riodeva. In the past this site has also yielded other dinosaur remains as well as fish and turtles.

The new sauropod has been named *Turiasaurus riodevensis*, after the area and village where it was found. It is estimated to have weighed 40 to 48 tonnes, equivalent to six or seven adult elephants, and is comparable to the world's largest known dinosaurs such as *Argentinosaurus* and *Brachiosaurus*. The length of *Turiasaurus* was between 30 and 37 metres – as long as a basketball court – and its humerus (the bone that runs from the shoulder to the elbow in the foreleg) as large as an adult human. In addition to the humerus, fragments of skull, scapula, femur, tibia and fibula, as well as teeth, vertebrae, ribs and phalanges were also found.

Analyse indicates that *Turiasaurus* represents a previously unrecognized branch of European sauropod evolution. Until now dinosaurs of this size have primarily been found in the Americas and Africa.

Report based on "A giant European dinosaur and a new sauropod clade" by Rafael Royo-Torres, Alberto Cobos and Luis Alcalá. *Science* 22 December 2006: Vol. 314, no. 5807, pp. 1925-1927; DOI: 10.1126/science.1132885

ANCIENT MARINE REPTILES DISCOVERED

A team, led by University of Adelaide palaeontologist Dr Benjamin Kear, has identified two new species of ancient marine reptiles that swam in the shallow waters of an inland sea in Australia, approximately 115 million years ago.

Umoonasaurus and *Opallionectes* belong to a group of animals called plesiosaurs – long-necked marine reptiles resembling the popular image of the Loch Ness monster that lived during the time of the dinosaurs.

Dr Kear and his fellow team members, Natalie Schroder and Dr Michael Lee from the School of Earth and Environmental Sciences and the South Australian Museum, identified the new species based on opalised fossils of 30 individuals found in old collections and recent excavations.

The team's findings were recently published in both the international journal *Palaeontology* and the online edition of *Biology Letters*, a periodical published by the Royal Society of London.

According to Dr Kear, *Umoonasaurus* was a rhomaleosaurid – a kind of plesiosaur that was the "killer" whale equivalent of the Jurassic. It is distinguished by its relatively small size (around 2.4 metres) and three crest-like ridges on its skull. It was surprisingly archaic in spite of its relatively late geologic age, outliving its giant predatory relatives by more than 100 million years.

The team named the reptile after Umoona, the Aboriginal name for the Cooper Pedy region where the most complete skeletons have been found.

Opallionectes was also a Plesiosaur but much larger – about six metres

long with masses of fine, needle-like teeth for trapping small fish and squid. Its name means "the opal swimmer from Andamooka".

Both creatures lived in a near-freezing inland seaway that covered most of the central and northern parts of the continent during the Early Cretaceous, when Australia was situated in a high-latitude (approx. 70°S) and still connected to Antarctica.

Report modified from a University of Adelaide Media Release dated 26 July 2006.

References:

Kear, B. P., 2006. Marine reptiles from the Lower Cretaceous of South Australia: elements of a high-latitude cold-water assemblage. *Palaeontology* 49(45), 837- 856.

Kear, B. P., Schroder, N. I. and Lee, M. S. Y., 2006. An archaic crested plesiosaur in opal from the Lower Cretaceous high-latitude deposits of Australia. *Biology Letters* [Royal Society, London] 2(4), 615-619; DOI 10.1098/rsbl.2006.0504

INDIGENOUS FOSSIL 'MOUSE' FOUND IN NEW ZEALAND

In December, 2006, palaeontologists, Trevor Worthy of Adelaide University, Alan Tennyson from the Museum of New Zealand, Wellington, and colleagues, reported the discovery of tiny fossil bones of a mouse-sized creature that lived between 19 and 16 million years ago on the South Island of New Zealand.

The discovery, reported in America's Proceedings of the National Academy of Sciences, was made in Early to earliest Middle Miocene age sediments of the Manuherikia Group, near St Bathans in Central Otago.

In 1978, a previously unknown fauna containing anatids (species belonging to a family of mainly aquatic birds) and fish was recovered from this area. However, the recent excavations, from three localities in the St Bathans district, have revealed a sphenodontid (a group that includes snakes, lizards & mososaurs), a crocodilian, geckos, skinks, bats and at least 24 avian taxa, as well as the two jawbones and one thigh bone of the new terrestrial mouse-sized mammal.

According to team member Susan Hand of the University of New

South Wales, the mammal bones are unlike the remains of any other fossil mammal yet found. The shape of the bones suggest a very primitive mammal that would have evolved before the mammal-line split into placental mammals and marsupials in the Early Cretaceous, 125 million years ago. It appears the mammal managed to survive for at least 100 million years before going extinct.

Although New Zealand separated from the ancient continent of Gondwana some 82 million years ago and much of its endemic biota is generally thought to reflect this last continental attachment, until now, land mammals were not thought to have arrived until human settlement occurred.

So far Australian and New Zealand researchers have examined only a fraction of the ancient Manuherikia lakebed (now sandstone) but will return to the Central Otargo sites in early January, 2007, in the hope of casting further light on the "ghost lineages" of ancient mammals.
[Initial source of information – New Zealand Herald, (Auckland) 14 Dec., 2006]

Reference:

Worthy, T. H., Tennyson, A. J. D., Archer, M., Musser, A. M., Hand, S. J., Jones, C., Douglas, B. J., McNamara, J. A. and Beck, R. M. D. Miocene mammal reveals a Mesozoic ghost lineage on insula New Zealand, southwest Pacific. *Proceedings of the National Academy of Sciences* published online Dec 11, 2006; doi: 10. 1073/pnas.0605684103

RARE EARLY TRIASSIC FOSSILS FOUND IN TASMANIA

Three perfectly preserved skulls of ancient salamander-like animals have been found in southern Tasmania. The skulls belong to an extinct group of amphibians called labyrinthodonts and are estimated to be about 245 million years old.

Andrew Rozefelds, Tasmanian Museum and Art Gallery Deputy Director of Collections and Research, said the find has been hailed as perhaps the most significant discovery of its kind in Tasmania in the last quarter of a century. The skulls are significant because they tell the history of life in Tasmania as well as adding to the evolutionary history of fossil amphibians from around the world.

The fossils were found in 2006 by long-time bushwalker and former Parks and Wildlife Service senior manager Bob Tyson. He reported the find to the Tasmanian Museum and Art Gallery staff who subsequently recovered the skulls and other amphibian and fish bones.

According to the Museum's vertebrate technician, Patrick Bender, these fossil amphibians belong to an extinct group of animals that predate the first mammals. The fossils are slightly harder than the surrounding mudstone and have been slowly exposed over time by the abrasive actions of wind and tides. There are up to 10 specimens lying preserved under the surface that need proper excavation. As there are only about six specimens of this type known in the world, the discovery is very exciting for the global scientific community.

Around 245 million years ago, south-eastern Tasmania was an extensive sandy floodplain, the largest animals being amphibians, reptiles and fish. Amphibians were the top of the food chain and probably fed on fish and other smaller animals that lived in the rivers and streams.

Fossil amphibian bones have previously been found at a number of localities in Tasmania, including Old Beach, the Derwent Valley and the Tasman Peninsula. Labrinthodont amphibians have also been found in similar-aged fossil deposits in Queensland, New South Wales and Western Australia.

When as much of the surrounding rock as possible has been cleaned away from the fossilized bones, it is hoped they will reveal new information about amphibians in Tasmania. This work has to be slowly done to avoid damage to the specimens.

To preserve the site and to allow further study of the area, the exact locality where the fossils were found is not being disclosed.
Information from the Tasmanian Museum and Art Gallery, Department of Tourism, Arts and the Environment, 13 December, 2006, and a report in ABC Newsonline.

FOSSILS STOLEN FROM THE SMITHSONIAN

In the middle of November (2006), a major theft occurred in the exhibit

halls of the National Museum of Natural History (Smithsonian), Washington D.C., USA. Five separate railing cases were broken into and nine fossil mammal and reptile specimens (all Cenozoic) stolen. Unfortunately the cases were not under direct camera surveillance, so there is no footage of the theft. The Museum has circulated a list of the specimens stolen hoping they may be recognised if offered for sale as personally collected or legitimately purchased fossils.

Information from Mid-America Paleontology Society (MAPS) Digest 29(6).

TALBRAGAR FISH RENAMED

In 2002, as part of her Graduate Diploma thesis, Australian National University student Lynne Bean completed a study of *Leptolepis talbragarensis* Woodward, 1895, the most common of the fossil fish found in the Talbragar Fish Beds, near Gulgong, New South Wales.

Bulk collections from the non-marine deposits in the Surat Basin were made during the 1880s and stored in the Australian Museum and the NSW Geological Survey, Sydney. Although virtually nothing was done in Australia to revise the fish fauna described by Woodward (1895); over the years many specimens had been exchanged with overseas Museums, resulting in Gloria Arratia (1997) erecting a new genus *Cavenderichthys* to replace *Leptolepis* to which Woodward had assigned the species *talbragerensis*.

Analysis of Australian held material from the Talbragar Fish Beds by Lynne Bean has shown up a number of characters, particularly in the dentary, hyomandibular, the vertebral column and the caudal structure, which support the view that *Cavenderichthys* is a valid genus and should be placed in the family Leptolepidae. The morphology, together with SHRIMP (Sensitive High Resolution Ion MicroProbe) dates on zircons obtained from a unit immediately below the fossil bed indicates a Late rather than an Early Jurassic age for the deposit.

In addition, Lynne Bean re-examined material from the Koonwarra Fossil Bed in Victoria and considered the Early Cretaceous fish *Leptoleplepis koonwarri* Waldman, 1971, also has a close affinity with *Cavenderichthys* and should be included in this new genus.

The Talbragar species *Cavenderichthys talbragarensis* occurs in a thin

bed only 60 cm thick, described in the past as a mudstone or chert. It has now been identified as an ash fall that filled a small lake and become silicified. Because of this phenomenon, the preservation of specimens is very good. On the other hand the Koonwarra Fossil Bed (in which *Cavenderichthys koonwarri* is found) is represented by 8 m of fine-grained mudstone interbedded between two fluviatile arkosic sandstones. The mudstones represent a lacustrine environment in the predominantly fluviatile sediments of the Victorian Lower Cretaceous (Drinnan & Chambers 1986).

References:

Arratia, G., 1997. Basal teleosts and teleostean phylogeny. *Palaeo Ichthyologica* 7: 5-168.

Bean, L., 2002. Report 2003-2004. Pp 40-41 in *Nomen Nudum* 29 (published May 2005).

Drinnan, A. N. & Chambers, T. C., 1986. Flora of the Lower Cretaceous Koonwarra Fossil Bed (Korumburra Group), South Gippsland, Victoria. *In* P. A. Jell & J. Roberts eds. Plants and invertebrates from the Lower Cretaceous Koonwarra Fossil Bed, South Gippsland, Victoria. *Memoir 3 of the Australian Association of Palaeontologists*: 205pp.

Waldman, M., 1971. Fish from the freshwater Lower Cretaceous of Victoria, Australia, with comments on palaeo-environment. *Special Papers in Palaeontology* 9: 1-124.

Woodward, A. S., 1895. The Fossil Fishes of the Talbragar Beds (Jurassic?) *with*, A note on their stratigraphical relations by T. W. E. David & E. F. Pitman. *Memoirs of the Geological Survey of New South Wales*, Palaeontology 9.

ONCE UPON A TIME

Pat Edwards

Once upon a time, a handsome prince of fossil collecting showed me his specimens and told me a story wrapped magically around the wonder of discovery, the rarity of each piece, and the adventure of fossil hunting. Perhaps it was the spell, but my once scientifically trained brain fogged over and I began to believe his fairy tale.

Before long I was taken to a quarry where fossils were known to occur. My first find was a small broken piece of *Fenestella*, and from that

moment I was hooked. As I learnt more about the tiny broken rock I was holding, the fog cleared just a little and I realised fossil hunting, once a person was hooked, was a singular passion for which people had to change their lives forever. By the time I began to suspect I would never recover, it was already too late.

Suddenly I had to learn a new language, words like 'spatulate', 'planispiral' and 'sedimentary' etc. began to be important. My clothes had to change from label to comfortable work boots and old shirts with plenty of pockets.

The car changed to 4x4. A prep bench and boxes started to fill up the once pristine spare room. Fingernails changed from 2 layers of 'Paris Red" to a quick clean with detergent once a week. The lounge room, once a haven for French antiques, changed into the resting place of a million books and a lucky hat that no one was allowed to touch.

I had to read late into the night, scour second hand bookshops, dig up old papers, journals and maps, and carefully, even rudely question any person who mentioned seeing things in rocks even 30 years ago.

Now I have to listen and learn as the spell grows stronger. I find that old hands 'specialise', some talk echinoids, some talk trilobites, but all provide stern warnings about wasting time on anything else. I have begun to do the same; fossil shells filling my mind while I can only show a passing interest in other things.

My valley no longer looks the same to me; rather than rolling hills it has become a Carboniferous and Permian area spoken about in terms of quarries, road cuts and finds. Holidays have changed from a trip to a resort, to a trip to a quarry in Gippsland, a creek in Queensland, or a rock sale somewhere outback.

My kids have started to worry about my sanity and demand that I tell them where I am going. They seem to think that I am never home and that one day I will disappear down a hole somewhere in the bush, never to be seen again.

Recently, I've started to talk about my finds as treasures, and lovingly look at my shells in their glass case. Finding an outstanding spiriferid brachiopod makes me happy for a week and outing a complete

Peruvispira is like running into an old friend.

There is no pre-collection life left to speak of. Dinners are now opportunities to swap distribution information rather than recipes. Christmas is a time to collect discarded gift boxes for fossil storage. Retirement means more opportunity for travel.

Christmas is a time to collect discarded gift boxes for fossil storage. Retirement means more opportunity for travel.

I think the spell is now complete.

Next week I'm showing grandsons my collection and will tell them all about my trips. I know a nice little quarry that I can take them to that has a lot of Carboniferous fossils - so they are sure to find something interesting. The eldest is now old enough to own his own 4x4 and the youngest a good reader. Their first find will be magic.

BOOK AND JOURNAL REVIEWS

SWIMMING IN STONE: THE AMAZING GOGO FOSSILS OF THE KIMBERLEY by John Long (2006). *Fremantle Arts Centre Press*, 272 pp. AU$29.95. ISBN 1921064331 (paperback).

When David Attenborough filmed his ground-breaking series *Life on Earth* in 1978, he chose one place in the world to demonstrate the early evolution of fishes: Gogo. Gogo, in the wild Kimberly district of Western Australia, is one of the world's most significant fossil sites because it shows 375 million-year old fishes preserved in stunning three-dimensional preservation. These fossils provide a rare window into the anatomy of primitive fishes at the critical stage when fishes where starting to evolve into the first land animals, the line ultimately leading to us humans. Yet despite being such an important fossil site, it has had a mysterious and chequered history of discovery.

Written by palaeontologist John Long, who has spent over 20 years searching and working the Gogo sites, Swimming in Stone tells the amazing stories of the people who discovered the fossils.

Information from CSIRO Publishing (www.publish.csiro.au/meltingpoint).

THE CHRONOLOGERS' QUEST: THE SEARCH FOR THE AGE OF THE EARTH by Patrick N. Wyse Jackson (2006). *Cambridge University Press*, 310 pp. AU$65.00. ISBN 0521813328 (hardback).

The debate over the age of the earth has been ongoing for over two thousand years, and has pitted physicists and astronomers against biologists, and religious philosophers against geologists. The Chronologers' Quest tells the fascinating story of our attempts to determine the age of the Earth. This book investigates the many novel methods used in the search for the Earth's age, from James Usher and John Lightfoot examining biblical chronologies, Compte de Buffon and Lord Kelvin determining the length of time for the cooling of the earth, to the more recent investigations of Arthur Holmes and Claire Patterson into radioactive dating of rocks and meteorites. The Chronologers' Quest is a readable account of the measurement of geological time. It will be of great interest to a wide range of readers, from those with little scientific background, to students and scientists in a wide range of the earth sciences.

Information from Abbey's Bookshop (www.abbeys.com.au/)

CAMBRO-ORDOVICIAN STUDIES II. Paterson, J. R. and Laurie, J. R., (eds), 2006. *Memoirs of the Association of Australasian Palaeontologists* 32: 422 pp. AU$127.60 Available from the Geological Society of Australia, Sydney. Telephone (02)92902194 or GSA Bookshop online – www.gsa.org.au/publications

These studies span the following topics in the Cambrian: Trilobites from South Australia, Northern Territory and California as well as a history of the North American biomere concept; Brachiopods from South Australia, Victoria and New South Wales; Arthropods and problematica from South Australia, Victoria and New South Wales; and a paper on conodonts from New South Wales which span the Cambro-Ordovician boundary. All the Ordovician papers are concerned with trilobites from the Northern Territory, New South Wales, Tasmania, China and Argentina. Of the 17 papers in the volume, 13 relate to Australian faunas.

EDITORIAL NOTES

I read with some interest the story on page 22 of this issue of fossils being stolen from the Smithsonian and relate that story back to another incident I have recently learnt of, one amateur stealing fossils from another. I will not go into the details but I find it very sad that one individual could steal fossils collected by another, especially when one takes into account the area they were collecting in is very abundant for fossil material, being over many square kilometres.

I have also recently been asked the question of when does an amateur collector become a dealer and will offer this opinion, **this is my opinion and does not reflect in any way those of the FCAA**. When an amateur collector trades or swaps material with another and no money changes hands then, in my opinion, the status of amateur collector is maintained. However, when an amateur continuously sells fossils for monetary gain then, in my opinion, they have crossed the line from amateur collector to dealer, the same is also true for the so called amateur collector who buys a collection then splits and on sells that collection. I am also fairly certain there would be some sort of tax issues with the above if the tax office were to learn of the practice. As a valuer of fossils for the Federal Government's tax incentive scheme, I also personally find it a little difficult to swallow some of the exorbitant prices being asked by some who hide behind the amateur collector tag. I would imagine there would also be some concerns by those who are legitimate dealers on the above practice as their livelihoods must be eroded into. I am also starting to understand how some professional palaeontologists feel about the amateur collector/dealer issue and can somewhat sympathise with the distrust they have for amateurs.

January 19 will see me heading to the United States for three weeks to experience the Tucson rock and mineral show along with, hopefully, the Grand Canyon and Monument Valley with snow. Will also be spending time fossil collecting, riding on some scenic train rides, astronomy if the sky is clear along with all other things a tourist can do in three weeks. I have also been told the possibility to collect sharks teeth from both active and inactive ant's nests might arise, an active ant's nest would be interesting.